



U.S. Environmental Protection Agency  
Region 8  
Technical and Management Services



Laboratory Services Program

Certificate of Analysis

Ref: 8TMS-L

MEMORANDUM

Date: 08/22/07

Subject: Analytical Results-- **Richardson Flats - Lower Silver Creek / SC-086**

From: Stan Christensen, EPA Region 8 Analytical Chemistry WAM

To: Stan Christensen  
Superfund  
8 EPR-SR

Received Sample Set(s), [Work Order : Date Received]:  
[ C708002 : 08/17/2007 ]

Attached are the analytical results for the samples received from the Richardson Flats - Lower Silver Creek sampling event, according to TDF SC-086. All analyses were performed within their method specified holding times unless otherwise noted in the following narrative.

These samples were prepared, analyzed, and verified by the Environmental Services Assistance Team Laboratory (ESAT) according to the requirements of the Technical Direction Form (TDF).

Note: The laboratory herewith transmits this deliverable to the program/project partner for determination of "final data usability" which may include data validation and data quality assessment per and in accordance with EPA QA/G-8, *Guidance on Environmental Data Verification and Data Validation*, November 2002, EPA/240/R-02/004. Laboratory data qualifiers are applied based on the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, October 2004, referred to as "NFGI".

**Case Narrative**

**C708002**

Quality Assessment: Unless indicated by exception, the QA/QC associated with this sample set produced data within the TDF-specified criteria.

Holding Times: All samples were analyzed within their method-specified technical holding time(s).

1. Initial and Continuing calibration blanks (ICBs and CCBs).  
Exceptions: None.
2. Preparation (PB) / Method blanks (MB)  
Exceptions: None.
3. Interference Checks (ICSA / ICSAB) for ICP-MS and ICP-OE analyses only.  
Exceptions: None.
4. Initial and Continuing calibration verification analyses (ICVs and CCVs).  
Exceptions: None.
5. Laboratory Control Sample (LCS) or second source analysis or SRM.  
Exceptions: None.
6. Laboratory Fortified blank (LFB) / Blank spike (BS), same source as used for the matrix spikes. PBS performed with analyses/methods requiring preparation or digestion prior to analysis.  
Exceptions: None.
7. Contract Reporting Detection Limit Standard, labeled as CRA, CRDL or CRL.  
Exceptions: None.
8. Laboratory Duplicate (DUP). "Source" identifies field sample duplicated in the laboratory. If either the "source" or the duplicate result is <5X the reporting limit, the %D limit of 20% does not apply.  
Exceptions: None.
9. Laboratory Matrix Spike (MS) and spike duplicate (MSD). "Source" defines original field sample fortified prior to analysis. Percent recovery (%R) limits do not apply when sample concentration(s) exceed the corresponding analyte spike level by a factor of 4 or greater.  
Exceptions: None.
10. Serial Dilution sample analysis (SRD). "Source" is parent field sample diluted 1:5 in the laboratory. Performed for ICP-OE and ICP-MS metals analyses. Percent difference (%D) limits do not apply when analyte concentration(s) are below 50x the source sample's MDL (or 10x it's PQL).  
Exceptions: None.
11. Internal standards, criteria specified for ICP-MS analyses only, monitored at the instrument.  
Exceptions: None.
12. Any calibration using more than two-points produced a correlation coefficient less than 0.995.  
Exceptions: None.

**Note:**

The following samples had visible sediment in the sample container:

GW5E1875, GW5W0125, GW6W0125, GW6W0625, GW4E0875, GW4E0375, GW3E0125, GW2E0625, GW2E0125 and GW2W0125. All samples were filtered prior to analysis.



TechLaw, Inc.  
Environmental Services Assistance Team  
16194 W. 45<sup>th</sup> Drive, Golden, CO 80403  
303-312-7726

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Task Order: 09  
TDF: SC-086  
LIMS: C708002  
DCN #: EP8-2-2095  
Contract: EP-W-06-33

Date: August 28, 2007

To: Stan Christensen, USEPA, Region 8 ESAT Task Order Project Officer

From: Richard Clinkscales, ESAT Senior Analytical Chemist

Through: Don Goodrich, ESAT Region 8 Team Manager

Subject: Richardson Flats – Silver Creek

**Due Date: 09/21/2007**

ESAT received samples for this phase of the project as follows:

✓ 08-17-07 Received 15 Water Samples for the following:

Sulfate by EPA Method 300.0 / SW-846 Method 9056

The analyses were completed within the requested TAT. ESAT's quality control procedures were used to verify accuracy of the results and to evaluate any matrix interferences.

Summaries of the sample results, QC data and analytical methods are detailed in the report following this cover.

Thank You,

# Traffic Report and Chain of Custody Record

Tetra Tech

1900 S. Sunset Street, Suite I-F, Longmont, CO 80501

<b>Project:</b> Lower Silver Creek <b>Location:</b> Park City, Utah <b>CERCLIS #:</b> <b>Contact:</b> Brianna Shanklin <b>Phone:</b> 303-772-5282 <b>email:</b> <a href="mailto:brianna.shanklin@tetratech.com">brianna.shanklin@tetratech.com</a> <b>Action:</b> SI sampling	<b>Laboratory:</b> ESAT Laboratory R8TMS-L-ESAT <b>Address:</b> 16194 W 45th Drive Golden, CO 80403 <b>Phone:</b> <b>Contact:</b> Richard Clinkscales	<b>P.O. Number:</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2" style="text-align: center;">CHAIN OF CUSTODY</th> </tr> <tr> <th style="width: 70%;">Signature</th> <th style="width: 30%;">Date/Time</th> </tr> <tr> <td>Submitted by: <i>Brianna Shanklin</i></td> <td>8/16/07 3:00 PM</td> </tr> <tr> <td>Received by Lab: <i>RC</i></td> <td>8/17/07 10:20</td> </tr> <tr> <td>Received by Analyst:</td> <td></td> </tr> <tr> <td>Returned to Lab:</td> <td></td> </tr> </table>	CHAIN OF CUSTODY		Signature	Date/Time	Submitted by: <i>Brianna Shanklin</i>	8/16/07 3:00 PM	Received by Lab: <i>RC</i>	8/17/07 10:20	Received by Analyst:		Returned to Lab:	
CHAIN OF CUSTODY														
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Received by Lab: <i>RC</i>	8/17/07 10:20													
Received by Analyst:														
Returned to Lab:														

Analysis Requested	Field Number	Description of Sample	Sample Date	Sample Time	Lab #
Sulfate	GW5E1875	250 mL poly bottle, filtered, preserved on ice (no acid)	8/15/2007	12:00 •	
Sulfate	GW5E1375	250 mL poly bottle, filtered, preserved on ice (no acid)	8/15/2007	14:40	
* Sulfate	GW5E1875	250 mL poly bottle, filtered, preserved on ice (no acid)	8/15/2007	15:40 •	
Sulfate	GW6E1350	250 mL poly bottle, filtered, preserved on ice (no acid)	8/15/2007	16:45	
Sulfate	GW6W0125	250 mL poly bottle, filtered, preserved on ice (no acid)	8/15/2007	17:35 •	
Sulfate	GW6W0625	250 mL poly bottle, filtered, preserved on ice (no acid)	8/15/2007	18:10 •	
Sulfate	GW4E0875	250 mL poly bottle, filtered, preserved on ice (no acid)	8/16/2007	8:55 •	
Sulfate	GW4E0375	250 mL poly bottle, filtered, preserved on ice (no acid)	8/16/2007	9:30 •	
Sulfate	GW3E1125	250 mL poly bottle, filtered, preserved on ice (no acid)	8/16/2007	11:05	
Sulfate	GW3E0125	250 mL poly bottle, filtered, preserved on ice (no acid)	8/16/2007	11:40 •	
Sulfate	GW2E0625	250 mL poly bottle, filtered, preserved on ice (no acid)	8/16/2007	12:20 •	
Sulfate	GW2E0125	250 mL poly bottle, filtered, preserved on ice (no acid)	8/16/2007	12:50 •	
Sulfate	GW2W0125	250 mL poly bottle, filtered, preserved on ice (no acid)	8/16/2007	13:15 •	
Sulfate	GW1E0125	250 mL poly bottle, filtered, preserved on ice (no acid)	8/16/2007	14:00	
Sulfate	GW1W0125	250 mL poly bottle, filtered, preserved on ice (no acid)	8/16/2007	14:20	

<b>Samplers Signature:</b> <i>Brianna Shanklin</i>	<b>Additional Sampler(s):</b> <i>Samuel P. White</i>	<b>Traffic Report #:</b> <b>UT - 785718522 - 08162007</b>
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Comments: *Upon receipt (\*) sample label does not match COC field ID - Left mess @ 1020 8/17/2007 RC*  
*- Used 10 from bottle per B. Shanklin - RC*

**TDF #: SC-086****Acronyms and Definitions:**

ESAT	Environmental Services Assistance Team
J	Data Estimated qualifier (also applied to all data less than PQL, greater than or equal to MDL)
MDL	Method Detection Limit
PQL	Practical Quantitation Limit (5x MDL), also known as reporting limit.
RPD	Relative Percent Difference (difference divided by the mean)
%D	Percent difference, serial dilution criteria unit, difference divided by the original result.
%R	Percent recovery, analyzed (less sample contribution) divided by true value
<	Analyte NOT DETECTED at or above the Method Detection Limit (MDL)
mg/L	Parts per million (milligrams per liter). Solids equivalent = mg/Kg.
ug/L	Parts per billion (micrograms per liter). Solids equivalent = ug/Kg.
NR	No Recovery (matrix spike) - Often seen for calcium/magnesium when their concentration exceeds the spike level by > 4x.
NFGI	USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, October 2004
RE	Sample Re-analysis. Usually seen on raw data and sequences for required sample dilutions due to over-range analytes.

**Method(s) Summary:**

As defined in the Technical Direction Form (TDF), some or all of the methods listed below were used for the determination of the reported target analytes.

From EPA's *Methods for the Determination of Metals in Environmental Samples*, Supplement I, May 1994, dissolved, total, and/or total recoverable metals were determined by:

- Method 200.7 / 6010B using a PE Optima ICP-OE (ICP).
- Method 200.8 / 6020 using a Perkin-Elmer Elan 6000 ICP-MS.
- Method 200.2 for total recoverable metals (only) digestion.
- Method 245.1 using a Perkin-Elmer FIMS CVAA (aqueous mercury only).

From *Standard Methods for the Examination of Water and Wastewater*, 18<sup>th</sup> Edition, 1992, Method 2340B was used for the calculated hardness determination. Hardness is reported as mg (milligram) equivalent CaCO<sub>3</sub> per liter (L) determined as follows:

$$\text{Calculated hardness} = 2.497 * (\text{Calcium, mg/L}) + 4.118 * (\text{Magnesium, mg/L}).$$

From EPA's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*,

- Method 3015A was used for microwave assisted total metals digestion.
- Method 7471B was used for mercury in solids by CVAA.

From EPA's *Determination of Inorganic Anions by Ion Chromatography*, Revision 2.1, 1993, Method 300.0 was used to determine the anions.

From EPA's *Methods for Chemical Analysis of Water and Wastes*, March 1983:

- Method 310.1 was followed for the alkalinity determination.
- Method 160.1 was followed for gravimetric total dissolved solids (TDS) determination.
- Method 160.2 was used for gravimetric total suspended solids (TSS) determination.
- Method 415.1 was used for total organic carbon (TOC) determination using either an Apollo 9000 or Phoenix 8000 Non-Dispersive IR (NDIR) system. Also known as dissolved organic carbon (DOC) when performed on the dissolved sample fraction.

The quality control procedures listed in the TDF request were utilized by ESAT to verify accuracy of the results and to evaluate any matrix interferences.

**Project Name: Richardson Flats - Lower Silver Creek****Certificate of Analysis****TDF #: SC-086****Classical Chemistry by EPA/ASTM/APHA Methods****Station ID: GW5E1875****Date / Time Sampled: 08/15/07 12:00****Workorder: C708002****EPA Tag No.:****Matrix: Ground Water****Lab Number: C708002-01 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	245	mg/L		5.0	1	08/21/2007	dbr	7H21001

**Classical Chemistry by EPA/ASTM/APHA Methods****Station ID: GW5E1375****Date / Time Sampled: 08/15/07 14:40****Workorder: C708002****EPA Tag No.:****Matrix: Ground Water****Lab Number: C708002-02 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	149	mg/L		5.0	1	08/21/2007	dbr	7H21001

**Classical Chemistry by EPA/ASTM/APHA Methods****Station ID: GW5W0125****Date / Time Sampled: 08/15/07 15:40****Workorder: C708002****EPA Tag No.:****Matrix: Ground Water****Lab Number: C708002-03 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	76.2	mg/L		5.0	1	08/21/2007	dbr	7H21001

**Classical Chemistry by EPA/ASTM/APHA Methods****Station ID: GW6E1350****Date / Time Sampled: 08/15/07 16:45****Workorder: C708002****EPA Tag No.:****Matrix: Ground Water****Lab Number: C708002-04 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	238	mg/L		5.0	1	08/21/2007	dbr	7H21001

**Project Name: Richardson Flats - Lower Silver Creek****Certificate of Analysis****TDF #: SC-086****Classical Chemistry by EPA/ASTM/APHA Methods****Station ID: GW6W0125****Date / Time Sampled: 08/15/07 17:35****Workorder: C708002****EPA Tag No.:****Matrix: Ground Water****Lab Number: C708002-05 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	425	mg/L		5.0	1	08/21/2007	dbr	7H21001

**Classical Chemistry by EPA/ASTM/APHA Methods****Station ID: GW6W0625****Date / Time Sampled: 08/15/07 18:10****Workorder: C708002****EPA Tag No.:****Matrix: Ground Water****Lab Number: C708002-06 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	191	mg/L		5.0	1	08/21/2007	dbr	7H21001

**Classical Chemistry by EPA/ASTM/APHA Methods****Station ID: GW4E0875****Date / Time Sampled: 08/16/07 08:55****Workorder: C708002****EPA Tag No.:****Matrix: Ground Water****Lab Number: C708002-07 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	216	mg/L		5.0	1	08/21/2007	dbr	7H21001

**Classical Chemistry by EPA/ASTM/APHA Methods****Station ID: GW4E0375****Date / Time Sampled: 08/16/07 09:30****Workorder: C708002****EPA Tag No.:****Matrix: Ground Water****Lab Number: C708002-08 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	906	mg/L		5.0	1	08/21/2007	dbr	7H21001

**Project Name: Richardson Flats - Lower Silver Creek****Certificate of Analysis****TDF #: SC-086****Classical Chemistry by EPA/ASTM/APHA Methods****Station ID: GW3E1125****Date / Time Sampled: 08/16/07 11:05****Workorder: C708002****EPA Tag No.:****Matrix: Ground Water****Lab Number: C708002-09 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	321	mg/L		5.0	1	08/21/2007	dbr	7H21001

**Classical Chemistry by EPA/ASTM/APHA Methods****Station ID: GW3E0125****Date / Time Sampled: 08/16/07 11:40****Workorder: C708002****EPA Tag No.:****Matrix: Ground Water****Lab Number: C708002-10 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	426	mg/L		5.0	1	08/21/2007	dbr	7H21001

**Classical Chemistry by EPA/ASTM/APHA Methods****Station ID: GW2E0625****Date / Time Sampled: 08/16/07 12:20****Workorder: C708002****EPA Tag No.:****Matrix: Ground Water****Lab Number: C708002-11 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	272	mg/L		5.0	1	08/21/2007	dbr	7H21001

**Classical Chemistry by EPA/ASTM/APHA Methods****Station ID: GW2E0125****Date / Time Sampled: 08/16/07 12:50****Workorder: C708002****EPA Tag No.:****Matrix: Ground Water****Lab Number: C708002-12 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	337	mg/L		5.0	1	08/21/2007	dbr	7H21001



**Project Name: Richardson Flats - Lower Silver Creek**

**Certificate of Analysis**

**TDF #: SC-086**

**Classical Chemistry by EPA/ASTM/APHA Methods**

**Station ID: GW2W0125**

**Date / Time Sampled: 08/16/07 13:15**

**Workorder: C708002**

**EPA Tag No.:**

**Matrix: Ground Water**

**Lab Number: C708002-13 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	69.3	mg/L		5.0	1	08/21/2007	dbr	7H21001

**Classical Chemistry by EPA/ASTM/APHA Methods**

**Station ID: GW1E0125**

**Date / Time Sampled: 08/16/07 14:00**

**Workorder: C708002**

**EPA Tag No.:**

**Matrix: Ground Water**

**Lab Number: C708002-14 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	221	mg/L		5.0	1	08/21/2007	dbr	7H21001

**Classical Chemistry by EPA/ASTM/APHA Methods**

**Station ID: GW1W0125**

**Date / Time Sampled: 08/16/07 14:20**

**Workorder: C708002**

**EPA Tag No.:**

**Matrix: Ground Water**

**Lab Number: C708002-15 A**

Method	Parameter	Results	Units	Q	Detection Limit	Dilution Factor	Analyzed	By	Batch
EPA 300.0	Sulfate as SO4	222	mg/L		5.0	1	08/21/2007	dbr	7H21001

"J" Qualifier indicates an estimated value

## Project Name: Richardson Flats - Lower Silver Creek

## Certificate of Analysis

TDF #:

SC-086

## Classical Chemistry by EPA/ASTM/APHA Methods - Quality Control

## TechLaw, Inc. - ESAT Region 8

Analyte	Result	MDL	Units	Spike Level	Source Result	%R	%R Limits	%D or RPD	%D or RPD Limit
ESAT Dionex IC									
Batch 7H21001 - No Prep Req			Water				ESAT Dionex IC		
Method Blank (7H21001-BLK1)		Dilution Factor: 1				Prepared & Analyzed: 08/21/07			
Sulfate as SO4	<		mg/L						
Method Blank Spike (7H21001-BS1)		Dilution Factor: 1				Prepared & Analyzed: 08/21/07			
Sulfate as SO4	26.0		mg/L	25.0		104	80-120		
Duplicate (7H21001-DUP1)		Dilution Factor: 1      Source: C708002-01				Prepared & Analyzed: 08/21/07			
Sulfate as SO4	207		mg/L		245			17	20
Duplicate (7H21001-DUP2)		Dilution Factor: 1      Source: C708002-11				Prepared & Analyzed: 08/21/07			
Sulfate as SO4	272		mg/L		272			0	20
Matrix Spike (7H21001-MS1)		Dilution Factor: 1      Source: C708002-01				Prepared & Analyzed: 08/21/07			
Sulfate as SO4	272		mg/L	25.0	245	108	80-120		
Matrix Spike (7H21001-MS2)		Dilution Factor: 1      Source: C708002-11				Prepared & Analyzed: 08/21/07			
Sulfate as SO4	252		mg/L	25.0	272	NR	80-120		
Matrix Spike Dup (7H21001-MSD1)		Dilution Factor: 1      Source: C708002-01				Prepared & Analyzed: 08/21/07			
Sulfate as SO4	268		mg/L	25.0	245	92	80-120	1	20
Matrix Spike Dup (7H21001-MSD2)		Dilution Factor: 1      Source: C708002-11				Prepared & Analyzed: 08/21/07			
Sulfate as SO4	291		mg/L	25.0	272	76	80-120	14	20

NOTE: %R = % Recovery, %R limits do not apply when sample levels exceed 4x the spike level.

RPD = Relative Percent Difference, %D = % Difference, MDL = Method Detection Limit for QC sample .

Project Name: Richardson Flats - Lower Silver Creek

Certificate of Analysis

TDF #: SC-086

**ESAT Region 8**  
**INORGANIC ANALYSES DATA SHEET**  
**Initial and Continuing Calibration Blanks**

Analytical Method: EPA 300.0

Analysis Name: WC - Anions by Ion Chromatography

Instrument: ESAT Dionex IC

Work Order: C708002

Analytical Sequence: 7080045 Dissolved

Concentration Units: mg/L

Blank criteria = +/- 5x analyte MDL (+/- PQL)

Analyte	Initial Calibration Blank (1 & 2)	Continuing Calibration Blanks				Method Blank (Batch ID)		MDL
Sulfate as SO4	0.00	1	2	3	4	7H21001-BLK1	NA	0.10
		0.00	0.00	0.00	0.00	0.00	NA	
		5	6	7	8			

TechLaw, Inc. - ESAT Region 8												
Initial and Continuing Calibration Verification Results												
ESAT Dionex IC			Method: EPA 300.0			Analysis Name: WC - Anions by Ion Chromatography						
Sequence: 7080045			Work Order: C708002			Units: mg/L						
Dissolved Analyte	Initial (ICV1, ICV2)			Continuing Calibration Verification Standards (CCVs)								
	True	Found	%R	True	Found	%R	True	Found	%R	True	Found	%R
Sulfate as SO4	65.0	60.2	92.6	1			2			3		
				100	104	104.0	100	95.8	95.8	100	109	109.0
				4			5			6		
				100	110	110.0						
				7			8			9		

Metals - ICV &amp; CCV %R Criteria = 90 - 110%, Classical Chemistry %R Criteria - ICV = 90 - 110%, CCV = 80 - 120%.

## ESAT Region 8

## INSTRUMENT ANALYSIS SEQUENCE LOG

Analytical Method: EPA 300.0

Dissolved

Sequence ID#: 7080045

Instrument ID #: ESAT Dionex IC

Water

LSR #: SC-086

Analysis ID	Sample Name	Analysis Date	Analysis Time
7080045-ICV1	Initial Cal Check	08/21/07	08:59
7080045-ICB1	Initial Cal Blank	08/21/07	09:15
7080045-CCV1	Calibration Check	08/21/07	09:32
7080045-CCB1	Calibration Blank	08/21/07	09:49
7H21001-BLK1	Blank	08/21/07	10:06
7H21001-BS1		08/21/07	10:22
C708002-01	GW5E1875	08/21/07	10:39
7H21001-DUP1	Duplicate	08/21/07	10:56
7H21001-MS1	Matrix Spike	08/21/07	11:12
7H21001-MSD1	Matrix Spike Dup	08/21/07	11:29
C708002-02	GW5E1375	08/21/07	11:46
C708002-03	GW5W0125	08/21/07	12:03
C708002-04	GW6E1350	08/21/07	12:19
C708002-05	GW6W0125	08/21/07	12:36
7080045-CCV2	Calibration Check	08/21/07	12:53
7080045-CCB2	Calibration Blank	08/21/07	13:10
C708002-06	GW6W0625	08/21/07	13:26
C708002-07	GW4E0875	08/21/07	13:43
C708002-08	GW4E0375	08/21/07	14:00
C708002-09	GW3E1125	08/21/07	14:17
C708002-10	GW3E0125	08/21/07	14:33
C708002-11	GW2E0625	08/21/07	14:50
7H21001-DUP2	Duplicate	08/21/07	15:07
7H21001-MS2	Matrix Spike	08/21/07	15:24
7H21001-MSD2	Matrix Spike Dup	08/21/07	15:40
C708002-12	GW2E0125	08/21/07	15:57
7080045-CCV3	Calibration Check	08/21/07	16:14
7080045-CCB3	Calibration Blank	08/21/07	16:31
C708002-13	GW2W0125	08/21/07	16:47
C708002-14	GW1E0125	08/21/07	17:04
C708002-15	GW1W0125	08/21/07	17:21
7080045-CCV4	Calibration Check	08/21/07	17:54
7080045-CCB4	Calibration Blank	08/21/07	18:11

**Project Name: Richardson Flats - Lower Silver Creek**

**Certificate of Analysis**

**TDF: SC-086**

**ESAT Region 8**

**ANALYTICAL TRANSACTIONS**

**Richardson Flats - Lower Silver Creek**

Analysis	Analysis Code	Samples	Dups	Spikes	Blanks	Check Samples & Stds	Dilutions \ Reruns	Analytical Sets
Sulfate	WC_Anions	15	2	5	7	5	21	1
<b>Total</b>		<b>15</b>	<b>2</b>	<b>5</b>	<b>7</b>	<b>5</b>	<b>21</b>	<b>1</b>



TechLaw, Inc.  
Environmental Services Assistance Team  
16194 W. 45<sup>th</sup> Drive, Golden, CO 80403  
303-312-7726

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Task Order: 09  
TDF: SC-086  
LIMS: C708002  
DCN #: EP8-2-2095  
Contract: EP-W-06-33

## **Certificates of Analysis**

Valid through October 2007

### **Alkalinity**

### **Anions by Ion Chromatography**

- Initial Calibration Verification (ICV) Standards
- Laboratory Check Standards (LCS)
- Matrix Spike Solutions
- Interference Check (ICSA / AB) Standards



195 Lehigh Avenue, Suite 4  
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# CERTIFICATE OF ANALYSIS

tel: 800.669.6799 · 732.901.1900  
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**INORGANIC VENTURES** is an ISO Guide 34:2000 registered Certified Reference Material (CRM) Manufacturer (Certificate #883-02). The certificate is designed and the data is determined in accordance with ISO Guide 31:2000 (Reference Materials-Contents of Certificates and Labels), ISO Guide 34:2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35:1989 "Certification of Reference Materials - General and Statistical Principles."

**WATER QC STANDARD Solids**  
Catalog No: QCP-SLD

Lot Number: Z-SLD01146

LMS: 7061801

**STABILITY AND STORAGE INFORMATION** - This standard can be stored at room temperature before and after opening. The EPA recommends a "maximum" holding time for solids samples of 7 days at 4 °C. Our stability data indicates that this standard should be disposed of in 3 months after opening.

## **SPECIFICATIONS AND TRACEABILITY:**

Parameter	Certified Value <sup>a</sup>	Made to Value <sup>c</sup>	Analytical Method	NIST Traceability	Acceptance Limits <sup>b</sup>
Filterable Residue	766 ± 14 mg/L	750 mg/L	EPA Method 160.1	Gravimetric <sup>e</sup>	963 - 569 mg/L
Non-filterable Residue	42.6 ± 4.8 mg/L	35 mg/L	EPA Method 160.2	Gravimetric <sup>e</sup>	48.1 - 37.1 mg/L
Total Residue	786 ± 22 mg/L	785 mg/L	EPA Method 160.3	Gravimetric <sup>e</sup>	988 - 584 mg/L

### **NOTES:**

<sup>a</sup> The certified value is based upon multiple analytical measurements using the analytical method referenced in this certificate. All analytical measurements are made using NIST Standard Reference Materials (SRM's) as the calibration standard (where available). All uncertainties are calculated as follows:

$$\frac{(\text{Student } t \text{ Variate at 95\% confidence interval})(\text{standard deviation})}{\sqrt{n}}$$

<sup>b</sup> Calculated from "Table of Statistics from EPA Water Pollution (WP) Performance Evaluation Studies (Based on retained data from EPA and State Laboratories)".

<sup>c</sup> Sometimes referred to as "true value" or "gravimetric value".

<sup>d</sup> This test is determined by analysis only.

<sup>e</sup> All balances are checked daily using an in-house procedure. See Balance Calibration.

Rec'd  
6-14-07  
DBR

11502 - 11506

4. 10CFR50 Appendix B – Nuclear Regulatory Commission – Domestic Licensing of Production and Utilization Facilities
5. 10CFR21 – Nuclear Regulatory Commission – Reporting Defects and Non-Compliance
6. MIL-STD-45662A (Obsolete/Observed)

**DATE OF CERTIFICATION AND PERIOD OF VALIDITY**

**Shelf Life** - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies of chemically-stable solutions performed at the manufacturer's facility show a CRM shelf-life of twenty one months for solutions packaged in 125-mL low density polyethylene bottles. When stored under special environmental controls that minimize transpiration and instability, the shelf life can be extended past this limit.

**Expiration Date** - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. The manufacturer concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

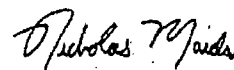
**Certification Date:** March 20, 2007

**Expiration Date:**

**EXPIRES**  
12/2008

**NAMES AND SIGNATURES OF CERTIFYING OFFICERS**

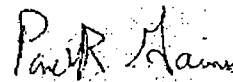
Certificate Prepared By: Nick Maida, Product Documentation Administrator



Certificate Approved By: Katalin Le, QC Manager



Certifying Officer: Paul Gaines, PhD., Senior Technical Director







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## WATER QC STANDARD Minerals

Catalog No: QCP-MIN

Lot Number: A2-QCP06B089

ESAT  
LIMS: ALK  
7061901

**STABILITY AND STORAGE INFORMATION** - Do not put transfer devices, probes, etc. in sample container. The insertion of a pH electrode, for example, can significantly increase the conductivity, potassium, and chloride values. This standard can be stored at room temperature before opening. After opening, the EPA recommends a "maximum" holding time for the following:

PARAMETER	HOLDING CONDITIONS	HOLDING TIME
Alkalinity	4°C	14 days
Conductivity	4°C	28 days
Chloride	None required	28 days
Sulfate	4°C	28 days
Nitrate as N	4°C	48 hours
Fluoride	None required	28 days
Sodium	HNO <sub>3</sub> to pH<2	6 months
Potassium	HNO <sub>3</sub> to pH<2	6 months

ESAT ICV  
LIMS - ANIONS  
7062101

Rec'd  
6-14-07  
DBR

11507 - 11509

**\*pH: The value listed below is for informational purposes only. The pH value of this CRM is not stable and cannot be relied upon. For a certified pH CRM, use catalog no. QCP-PH.**

### SPECIFICATIONS:

Parameter	Certified Value <sup>a</sup>	Made to Value <sup>d</sup>	Analytical Method	NIST Traceability	Acceptance Limits <sup>b</sup>
Alkalinity	53.43 ± 0.45 mg/L CaCO <sub>3</sub>	Measured <sup>a</sup>	EPA Method 310.1	723d	58.54 - 48.31 mg/L CaCO <sub>3</sub>
Conductivity	445 ± 4 µmhos/cm @ 25°C	Measured <sup>a</sup>	EPA Method 120.1	999a	492 - 398 µmhos/cm @ 25°C
pH	8.62 units	Measured <sup>a</sup>	EPA Method 150.1	186g, 185h	*See parameters table above
Chloride	37.73 ± 0.09 mg/L	37.94 mg/L	EPA Method 300.0	3182	41.84 - 33.62 mg/L
Fluoride	4.042 ± 0.070 mg/L	4.000 mg/L	EPA Method 300.0	3183	4.385 - 3.700 mg/L
Sulfate	65.05 ± 0.15 mg/L	64.99 mg/L	EPA Method 300.0	3154	74.77 - 55.33 mg/L
Nitrate as N	2.482 ± 0.008 mg/L	2.504 mg/L	EPA Method 300.0	3185	3.005 - 1.958 mg/L
Sodium	59.08 ± 0.12 mg/L	52.28 mg/L	ICP <sup>c</sup>	3152a	65.07 - 53.08 mg/L
Potassium	60.14 ± 0.28 mg/L	52.86 mg/L	ICP <sup>c</sup>	3141a	68.73 - 51.55 mg/L

### NOTES:

<sup>a</sup> The certified value is based upon multiple analytical measurements using the analytical method referenced in this certificate. All analytical measurements are made using NIST Standard Reference Materials (SRM's) as the calibration standard (where available). All uncertainties are calculated as follows:

$$\pm (\text{Student } t \text{ Variate at 95\% confidence interval})(\text{standard deviation})$$

$\sqrt{n}$

<sup>b</sup> Calculated from "Table of Statistics from EPA Water Pollution (WP) Performance Evaluation Studies (Based on retained data from EPA and State Laboratories)".

<sup>c</sup> All ICP measurements by IV Labs are made using our in-house procedure (9-QC-001) where all samples are bracketed by matrix matched NIST standard measurements. All ICP measurements are performed by using multiple emission lines for each element, to confirm the absence of spectral interferences.

<sup>d</sup> Sometimes referred to as "true value" or "gravimetric value".

• This test is determined by analysis only.

#### QUALITY STANDARD DOCUMENTATION



1. ISO 9001 QMI Registered Quality System (Certificate Number 010105)

Members of IQ Net : Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

2. 10CFR50 Appendix B
3. 10CFR21

Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

#### STABILITY/ EXPIRATION DOCUMENTATION

**Shelf Life -** The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

**Expiration Date -** The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

#### PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 µm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

#### GLASSWARE CALIBRATION

In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of all CRMs.

#### BALANCE CALIBRATION

All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 428359B and 454678. The NIST test number is 822/260017-98.

All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

#### THERMOMETER CALIBRATION

The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

#### TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of products.  
TEL 1-800-569-6799 FAX 1-732-901-1903 E-MAIL info@inorganicventures.com

**Certification Date:** January 30, 2007

**Prepared By:**

*Nicholas Maide*

**Expiration Date:**

**EXPIRES**  
1/1/2008

**Approved By:**

*Kathleen L.*

**Certifying Officer:**

*Paul R. Gaines*



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**2.0** **DESCRIPTION OF CRM** Ion Chromatography Stock Second Source Solution

Catalog No.: QCP-QCS-5

Lot Number: Y-ION18056

Matrix: H<sub>2</sub>O

11006  
09/07/2006

**Second Source:** This solution was manufactured from a second set of concentrates maintained in our manufacturing facility.

75.00 µg/mL each: Sulfate,

50.00 µg/mL each: Bromide,

25.00 µg/mL each: o-Phosphate as P,

15.00 µg/mL each: Chloride, Nitrite\_as\_N,

10.00 µg/mL each: Fluoride, Nitrate\_as\_N

### 3.0 CERTIFIED VALUES AND UNCERTAINTIES

ION	CERTIFIED VALUE	ION	CERTIFIED VALUE	ION	CERTIFIED VALUE
Bromide	49.99 ± 0.12 µg/mL	Chloride	15.01 ± 0.03 µg/mL	Fluoride	9.99 ± 0.03 µg/mL
Nitrate_as_N	10.02 ± 0.03 µg/mL	Nitrite_as_N	14.98 ± 0.04 µg/mL	o-Phosphate as P	24.97 ± 0.07 µg/mL
Sulfate	74.9 ± 0.2 µg/mL				

**Certified Density:** 0.997 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_1}{n}$$

( $\bar{x}$ ) = mean  
x<sub>1</sub> = individual results  
n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2[(\sum s_1)^2]}{(n)^{1/2}}$$

$\sum s_1$  = The summation of all significant estimated errors  
(Most common are the errors from instrumental measurement weighting, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

### 4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties."

(ISO VIM, 2nd ed., 1993, definition 6.10)

· This IV product is Traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume



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**2.0 DESCRIPTION OF CRM** Ion Chromatography 10,000 µg/mL Bromide IC in Water

Catalog Number: ICBR10K  
Lot Number: Z-QBR02010  
Starting Material: Potassium Bromide  
Starting Material Purity (%): 99.9900  
Starting Material Lot No.: 09014BY  
Matrix: Water

11007  
09/07/2006

**3.0 CERTIFIED VALUES AND UNCERTAINTIES**

**Certified Concentration:** 10,043 ± 23 µg/mL

**Certified Density:** 1.008 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

( $\bar{x}$ ) = mean

$x_i$  = individual results

$n$  = number of measurements

$$\text{Uncertainty } (\pm) = 2 \left[ \frac{(\sum s_i)^2}{n} \right]^{1/2}$$

$\sum s_i$  = The summation of all significant estimated errors

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

**4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

"Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties."  
(ISO VIM, 2nd ed., 1993, definition 6.10)

This product is Traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

**Assay Method #1** 10,081 ± 43 µg/mL  
IC Assay NIST SRM 3184 Lot Number: 020701  
**Assay Method #2** 10,043 ± 23 µg/mL  
Volhard NIST SRM 999a Lot Number: 999a



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**2.0 DESCRIPTION OF CRM** Ion Chromatography 10,000 µg/mL Chloride in Water

Catalog Number: ICCL10-1 and ICCL10-5

Lot Number: **Y-CL01071**

Starting Material: Potassium Chloride

Starting Material Purity (%): 99.0000

Starting Material Lot No.: 05606PW

Matrix: Water

11008  
09/07/2006

**3.0 CERTIFIED VALUES AND UNCERTAINTIES**

**Certified Concentration:** 9952 ± 19 µg/mL

**Certified Density:** 1.011 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

( $\bar{x}$ ) = mean

$x_i$  = individual results

$n$  = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$\sum s_i$  = The summation of all significant estimated errors

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

**4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

"Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties."  
(ISO VIM, 2nd ed., 1993, definition 6.10)

This product is Traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

**Assay Method #1** 9952 ± 19 µg/mL

IC Assay NIST SRM 3182 Lot Number: 990506

**Assay Method #2** 9967 ± 23 µg/mL

Volhard NIST SRM 999a Lot Number: 999a



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**2.0 DESCRIPTION OF CRM** Ion Chromatography 10,000 µg/mL Fluoride in Water

Catalog Number: ICF10K  
Lot Number: Z-QF01093  
Starting Material: Sodium Fluoride  
Starting Material Purity (%): 99.9900  
Starting Material Lot No.: 13108TI  
Matrix: Water

11009  
09/07/2006

**3.0 CERTIFIED VALUES AND UNCERTAINTIES**

**Certified Concentration:** 10,150 ± 23 µg/mL

**Certified Density:** 1.021 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

( $\bar{x}$ ) = mean

$x_i$  = individual results

$n$  = number of measurements

$$\text{Uncertainty } (\pm) = 2 \left[ \frac{(\sum s_i^2)}{n} \right]^{1/2}$$

$\sum s_i$  = The summation of all significant estimated errors

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

**4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

• "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

• This product is Traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

**Assay Method #1** 10,150 ± 23 µg/mL (Avg. of 2 Runs)

IC Assay NIST SRM 3183 Lot Number: 991510

**Assay Method #2** 10,000 ± 50 µg/mL

Gravimetric NIST SRM Lot Number: See Sec. 4.2



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**2.0** **DESCRIPTION OF CRM** Ion Chromatography 10000 µg/mL Nitrite in Water

Catalog Number: ICNNO310K  
Lot Number: Y-NOX02037  
Starting Material: Sodium Nitrate  
Starting Material Purity (%): 99.0000  
Starting Material Lot No.: 12616AC  
Matrix: Water

11010  
09/07/2006

**3.0** **CERTIFIED VALUES AND UNCERTAINTIES**

**Certified Concentration:** 10,109 ± 39 µg/mL

**Certified Density:** 1.037 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

( $\bar{x}$ ) = mean

$x_i$  = individual results

$n$  = number of measurements

$$\text{Uncertainty } (\pm) = 2 \left[ \frac{(\sum s_i)^2}{n} \right]^{1/2}$$

$\sum s_i$  = The summation of all significant estimated errors

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

**4.0** **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

• "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

• This product is Traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

**Assay Method #1** 10,109 ± 39 µg/mL (Avg. of 2 runs)

IC Assay NIST SRM 3185 Lot Number: 991508

**Assay Method #2** 10,044 ± 50 µg/mL

Gravimetric NIST SRM Lot Number: See Sec. 4.2



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**2.0** **DESCRIPTION OF CRM** Ion Chromatography 10000 µg/mL Nitrite as N in Water

Catalog Number: ICNNO210K  
Lot Number: Z-QNOX02150  
Starting Material: Sodium Nitrite  
Starting Material Purity (%): 99.6000  
Starting Material Lot No.: 18122HO  
Matrix: Water

11011  
09/07/2006

**3.0** **CERTIFIED VALUES AND UNCERTAINTIES**

**Certified Concentration:** 9992 ± 27 µg/mL

**Certified Density:** 1.035 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

( $\bar{x}$ ) = mean

$x_i$  = individual results

$n$  = number of measurements

$$\text{Uncertainty } (\pm) = 2 \left[ \frac{(\sum s_i)^2}{n} \right]^{1/2}$$

$\sum s_i$  = The summation of all significant estimated errors

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

**4.0** **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

• "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

• This product is Traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

**Assay Method #1** 9,992 ± 27 µg/mL (Avg. of 2 Runs)

IC Assay NIST SRM 40h Lot Number: 40h

**Assay Method #2** 10,075 ± 50 µg/mL

Gravimetric NIST SRM Lot Number: See Sec. 4.2





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**1.0 INORGANIC VENTURES** is an ISO Guide 34:2000 registered Certified Reference Material (CRM) Manufacturer (Certificate #883-02). The certificate is designed and the data is determined in accordance with ISO Guide 31:2000 (Reference Materials-Contents of Certificates and Labels), ISO Guide 34:2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35:1989 "Certification of Reference Materials - General and Statistical Principles."

**2.0 DESCRIPTION OF CRM** Ion Chromatography 10,000 µg/mL Sulfate in Water

Catalog Number: ICSO410-1 and ICSO410-5  
Lot Number: **Z-QSOX01127**  
Starting Material: Potassium Sulfate  
Starting Material Purity (%): 99.0000  
Starting Material Lot No.: 05013BA 01712PY 09120LU  
Matrix: Water

11012  
09/07/2006

**3.0 CERTIFIED VALUES AND UNCERTAINTIES**

**Certified Concentration:** 9975 ± 27 µg/mL

**Certified Density:** 1.012 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

( $\bar{x}$ ) = mean

$x_i$  = individual results

$n$  = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$\sum s_i$  = The summation of all significant estimated errors

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

**4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

· "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties."  
(ISO VIM, 2nd ed., 1993, definition 6.10)

· This product is Traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

**Assay Method #1**      **9975 ± 27 µg/mL (Avg. of 2 Runs)**  
IC Assay NIST SRM 3154 Lot Number: 892205

**Assay Method #2**      **10,020 ± 50 µg/mL**  
Gravimetric NIST SRM Lot Number: See Sec. 4.2



TechLaw, Inc.  
Environmental Services Assistance Team  
16194 W. 45<sup>th</sup> Drive, Golden, CO 80403  
303-312-7726

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Task Order: 09  
TDF: SC-086  
LIMS: C708002  
DCN #: EP8-2-2095  
Contract: EP-W-06-33

**Richardson Flats – Silver Creek**

Sample Identification  
Cross-Reference Information

<b>EPA Sample ID</b>	<b>ESAT LIMS ID</b>
GW5E1875	C708002-01
GW5E1375	C708002-02
GW5E1875	C708002-03
GW6E1350	C708002-04
GW6W0125	C708002-05
GW6W0625	C708002-06
GW4E0875	C708002-07
GW4E0375	C708002-08
GW3E1125	C708002-09
GW3E0125	C708002-10
GW2E0625	C708002-11
GW2E0125	C708002-12
GW2W0125	C708002-13
GW1E0125	C708002-14
GW1W0125	C708002-15

# ESAT Technical Direction Form

EPA Region 8

Contractor: TechLaw

Updated 05/08/2006

Contract No: EP-W-06-033

I. Task Monitor: SC

II. Task No. 86

III. Site: Richardson Flats

IV. Date Issued: 8/2/2007

V. Summary (80 chars): Analyze approximately 30 water samples for Sulfate.

VI. Matrix: ☒ Water ☐ Soils ☐ Vegetation ☐ Biota

VII. Project Name (80 chars): Silver Creek

## VIII. Details:

Richardson Flats

Site#

2007 TR2B 08L 302DD2C 0894BD01

## IX. Requested Analytes – Wet Chemistry

☐ Total Suspended Solids ☐ Total Dissolved Solids ☐ Dissolved Organic Carbon ☐ Alkalinity  
☐ Anions ☐ Chloride ☒ Sulfate ☐ Fluoride ☐ Nitrate ☐ Nitrite ☐ Other (\_\_\_Hardness 2340B\_\_\_)

## X. Requested Analytes – Metals

☐ Dissolved ☐ Total Recoverable ☐ Total ☐ Hardness, Calculated

200.7 ☐ Al ☐ Ba ☐ Be ☐ B ☐ Ca ☐ Co ☐ Cr ☐ Cu ☐ Fe ☐ K ☐ Mg  
☐ Mn ☐ Mo ☐ Na ☐ SiO2 ☐ Sr ☐ Ti ☐ V ☐ Zn

200.8 ☐ Ag ☐ As ☐ Cd ☐ Ni ☐ Pb ☐ Sb ☐ Se ☐ Th ☐ Tl ☐ U

Description		Due Date
1	Provide final deliverable package to Task Monitor no later than 30 days after delivery of the last set of samples.	9/21/2007
2		
3		
4		
5		
6		
7		
8		
9		
10		

VII. Deliverables: